FIG. 1

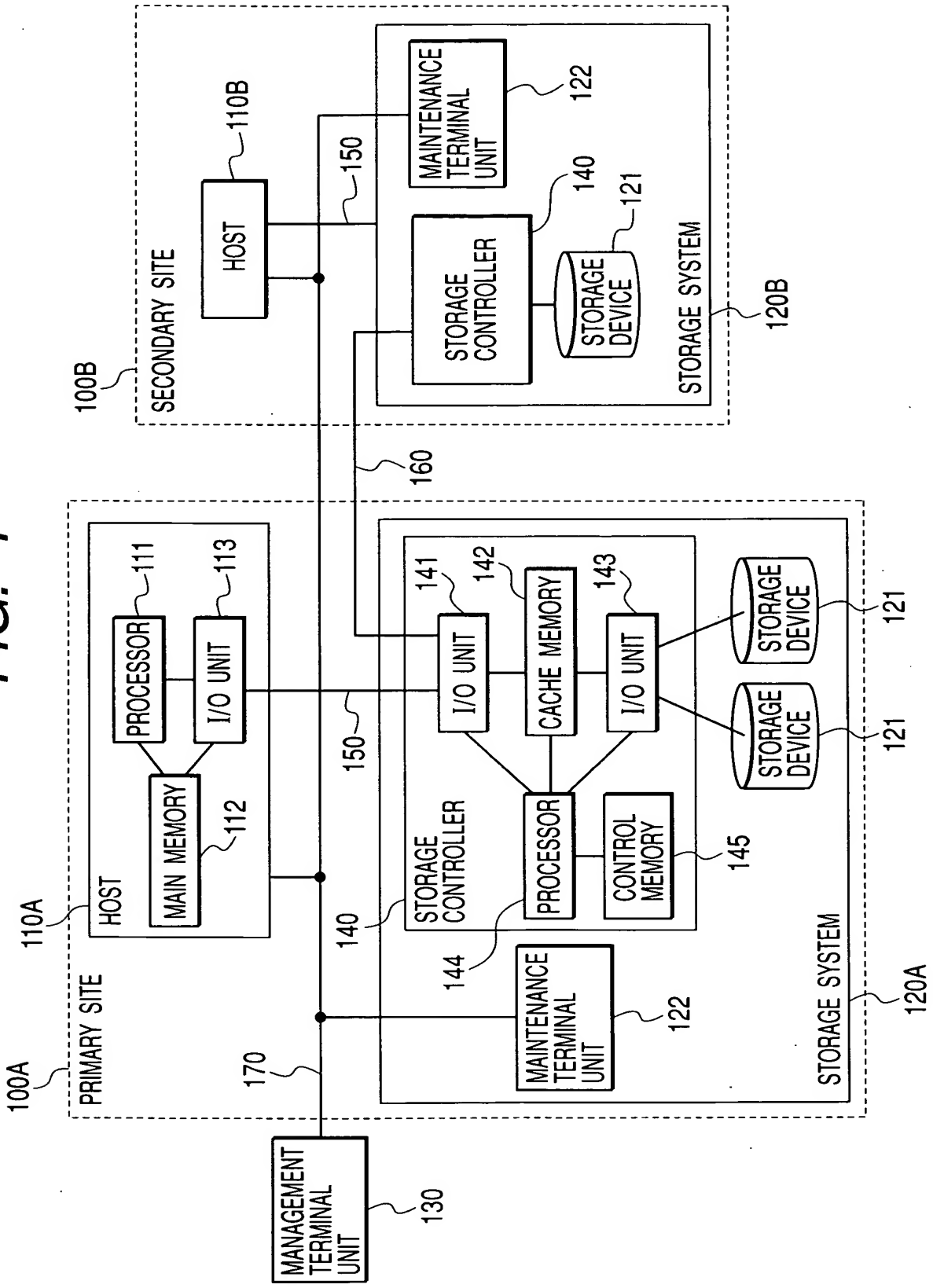

SECONDARY SITE
100B
HOST
110B
150
MAINTENANCE TERMINAL UNIT
122
STORAGE CONTROLLER
140
STORAGE DEVICE
121
STORAGE SYSTEM
120B
160
PRIMARY SITE
100A
HOST
110A
PROCESSOR
111
I/O UNIT
113
MAIN MEMORY
112
150
STORAGE CONTROLLER
140
I/O UNIT
141
CACHE MEMORY
142
I/O UNIT
143
PROCESSOR
144
CONTROL MEMORY
145
STORAGE DEVICE
121
STORAGE DEVICE
121
MAINTENANCE TERMINAL UNIT
122
STORAGE SYSTEM
120A
170
MANAGEMENT TERMINAL UNIT
130

FIG. 2

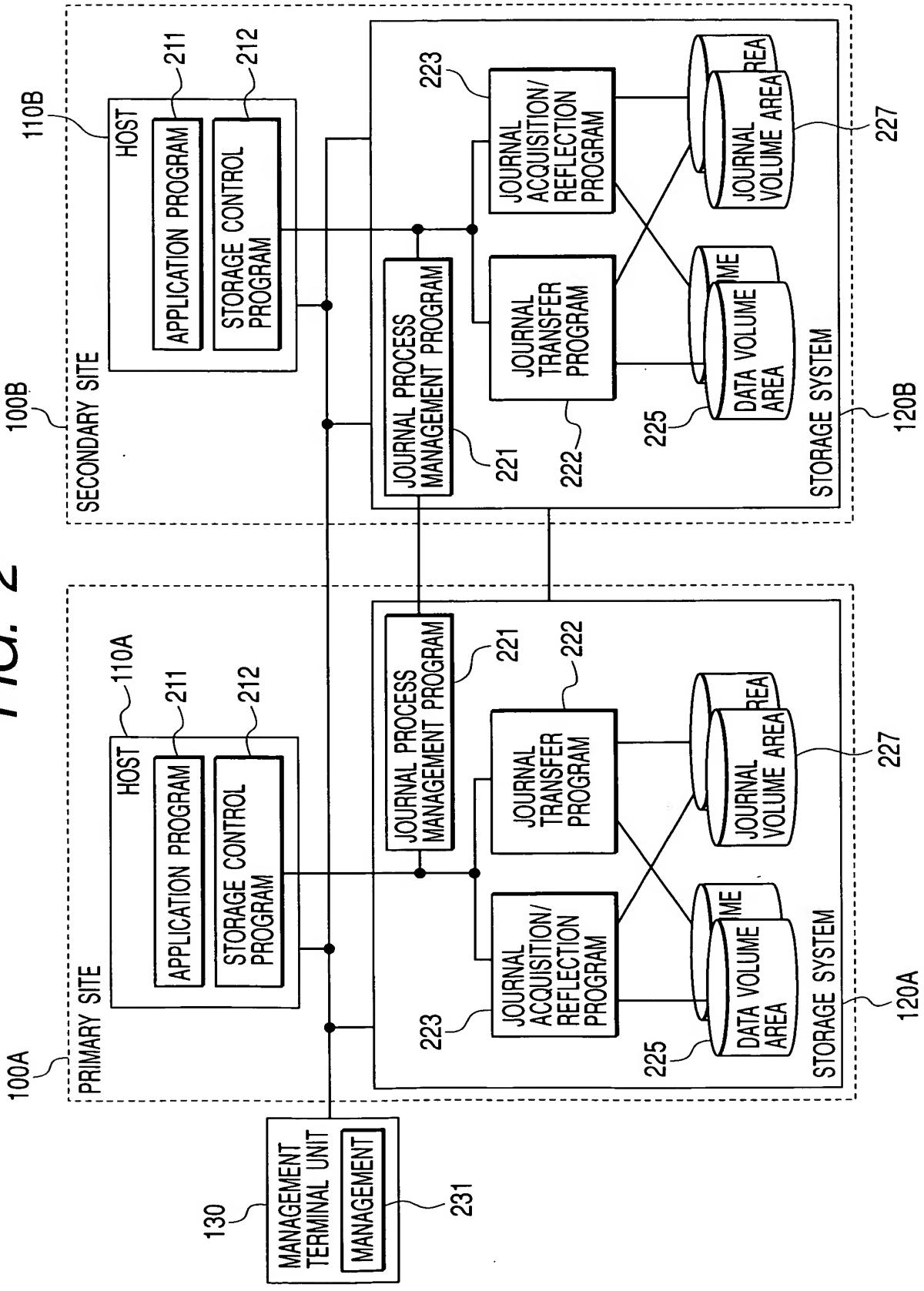

100A
PRIMARY SITE
110A
HOST
APPLICATION PROGRAM
211
STORAGE CONTROL PROGRAM
212
JOURNAL PROCESS MANAGEMENT PROGRAM
221
JOURNAL TRANSFER PROGRAM
222
JOURNAL ACQUISITION/ REFLECTION PROGRAM
223
DATA VOLUME AREA
225
JOURNAL VOLUME AREA
227
STORAGE SYSTEM
120A
100B
SECONDARY SITE
110B
HOST
APPLICATION PROGRAM
211
STORAGE CONTROL PROGRAM
212
JOURNAL PROCESS MANAGEMENT PROGRAM
221
JOURNAL TRANSFER PROGRAM
222
JOURNAL ACQUISITION/ REFLECTION PROGRAM
223
DATA VOLUME AREA
225
JOURNAL VOLUME AREA
227
STORAGE SYSTEM
120B
130
MANAGEMENT TERMINAL UNIT
MANAGEMENT
231

FIG. 3

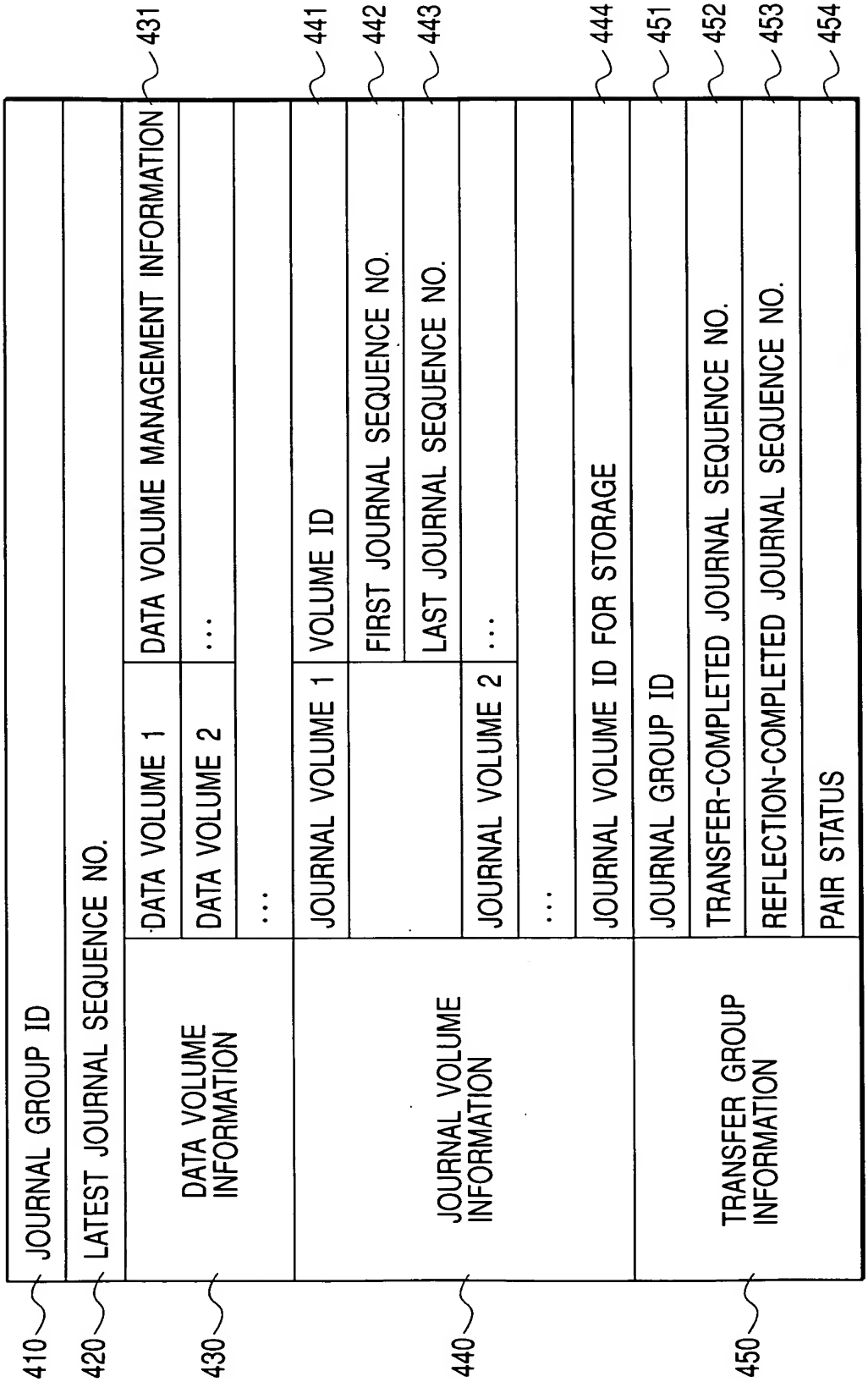

410
JOURNAL GROUP ID
420
LATEST JOURNAL SEQUENCE NO.
430
DATA VOLUME INFORMATION
DATA VOLUME 1
DATA VOLUME 2
...
431
DATA VOLUME MANAGEMENT INFORMATION
...
440
JOURNAL VOLUME INFORMATION
JOURNAL VOLUME 1
JOURNAL VOLUME 2
...
441
VOLUME ID
442
FIRST JOURNAL SEQUENCE NO.
443
LAST JOURNAL SEQUENCE NO.
...
444
JOURNAL VOLUME ID FOR STORAGE
450
TRANSFER GROUP INFORMATION
451
JOURNAL GROUP ID
452
TRANSFER-COMPLETED JOURNAL SEQUENCE NO.
453
REFLECTION-COMPLETED JOURNAL SEQUENCE NO.
454
PAIR STATUS

FIG. 4

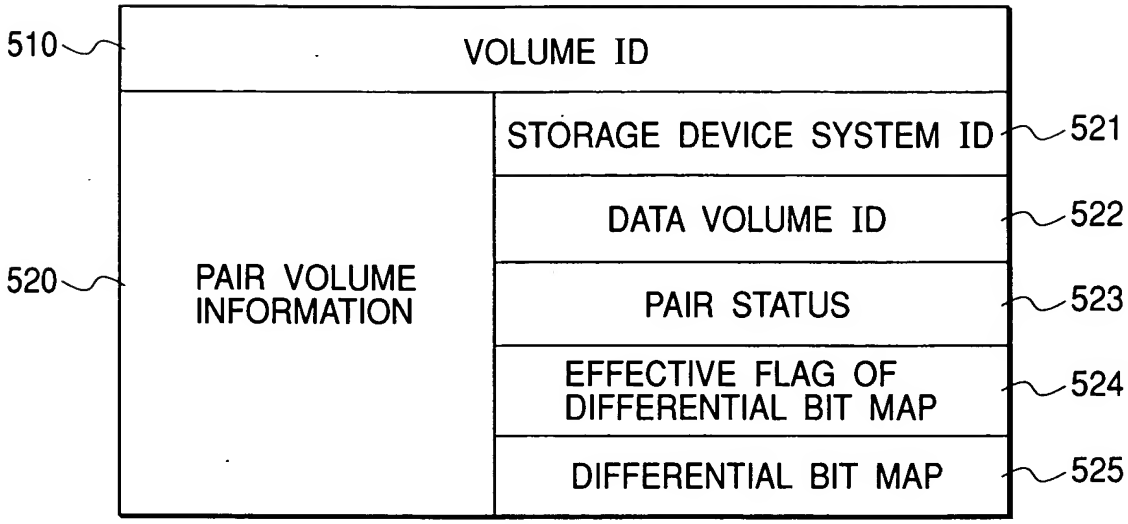

510
VOLUME ID
520
PAIR VOLUME INFORMATION
STORAGE DEVICE SYSTEM ID
521
DATA VOLUME ID
522
PAIR STATUS
523
EFFECTIVE FLAG OF DIFFERENTIAL BIT MAP
524
DIFFERENTIAL BIT MAP
525

FIG. 5

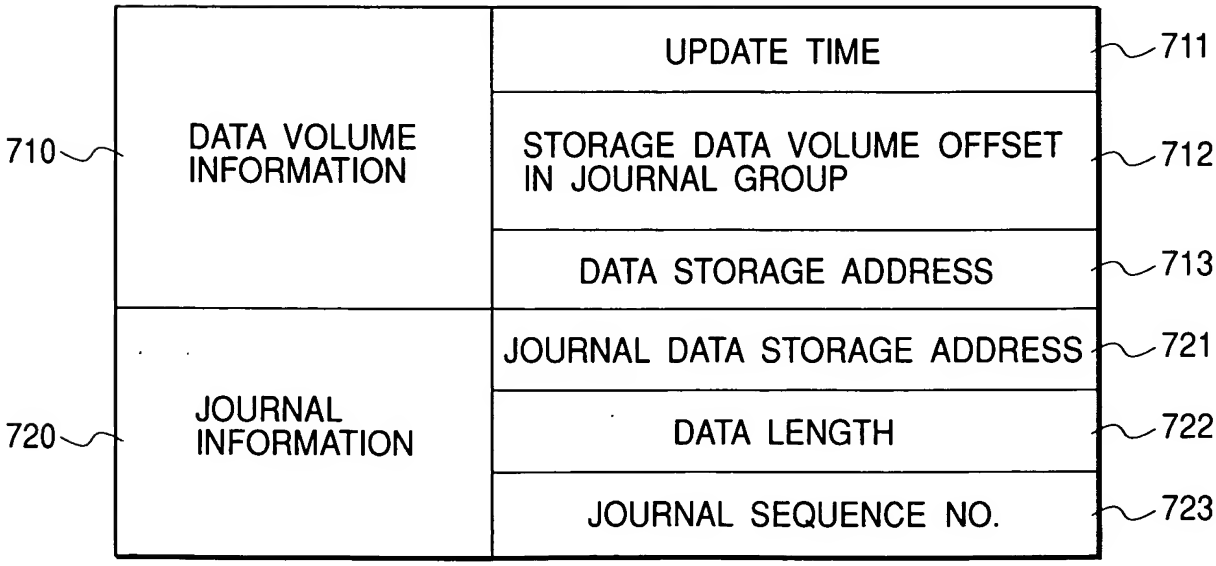

710
DATA VOLUME INFORMATION
UPDATE TIME
711
STORAGE DATA VOLUME OFFSET IN JOURNAL GROUP
712
DATA STORAGE ADDRESS
713
720
JOURNAL INFORMATION
JOURNAL DATA STORAGE ADDRESS
721
DATA LENGTH
722
JOURNAL SEQUENCE NO.
723

FIG. 6

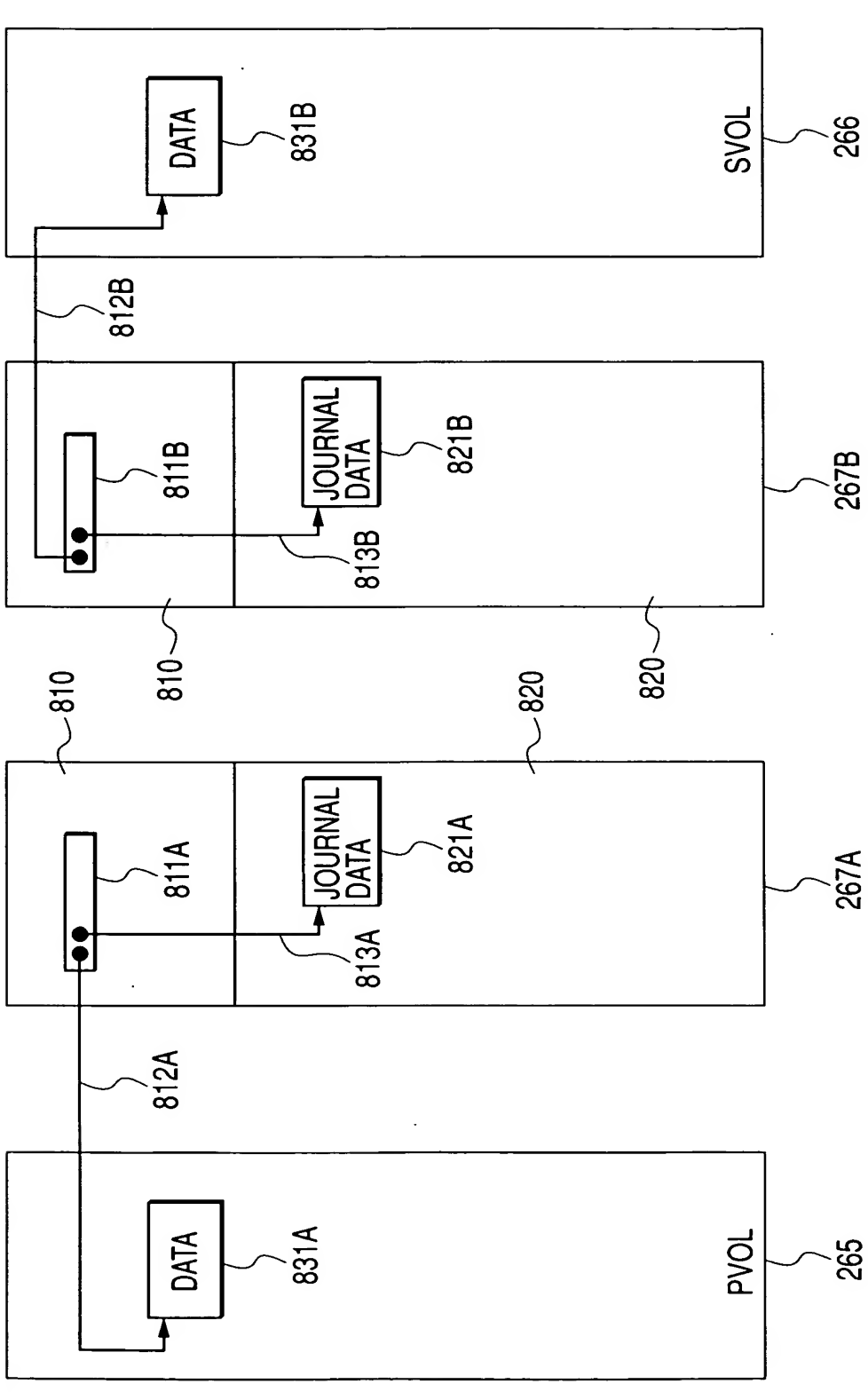

DATA
831B
SVOL
266
812B
811B
JOURNAL DATA
821B
813B
267B
810
820
811A
JOURNAL DATA
821A
813A
267A
812A
DATA
831A
PVOL
265

FIG. 7

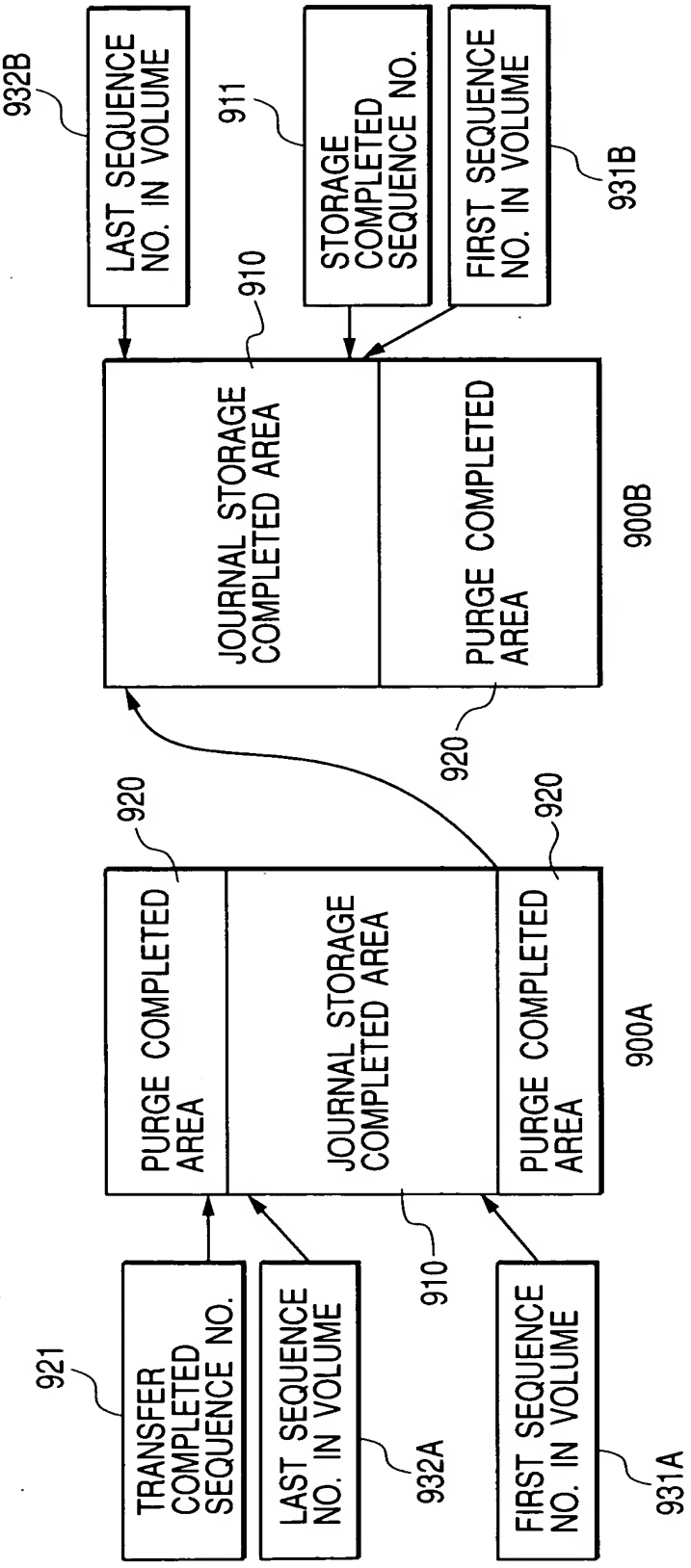

932B
LAST SEQUENCE NO. IN VOLUME
911
STORAGE COMPLETED SEQUENCE NO.
FIRST SEQUENCE NO. IN VOLUME
931B
910
JOURNAL STORAGE COMPLETED AREA
PURGE COMPLETED AREA
900B
920
920
920
PURGE COMPLETED AREA
JOURNAL STORAGE COMPLETED AREA
PURGE COMPLETED AREA
900A
921
TRANSFER COMPLETED SEQUENCE NO.
LAST SEQUENCE NO. IN VOLUME
910
FIRST SEQUENCE NO. IN VOLUME
932A
931A

FIG. 8

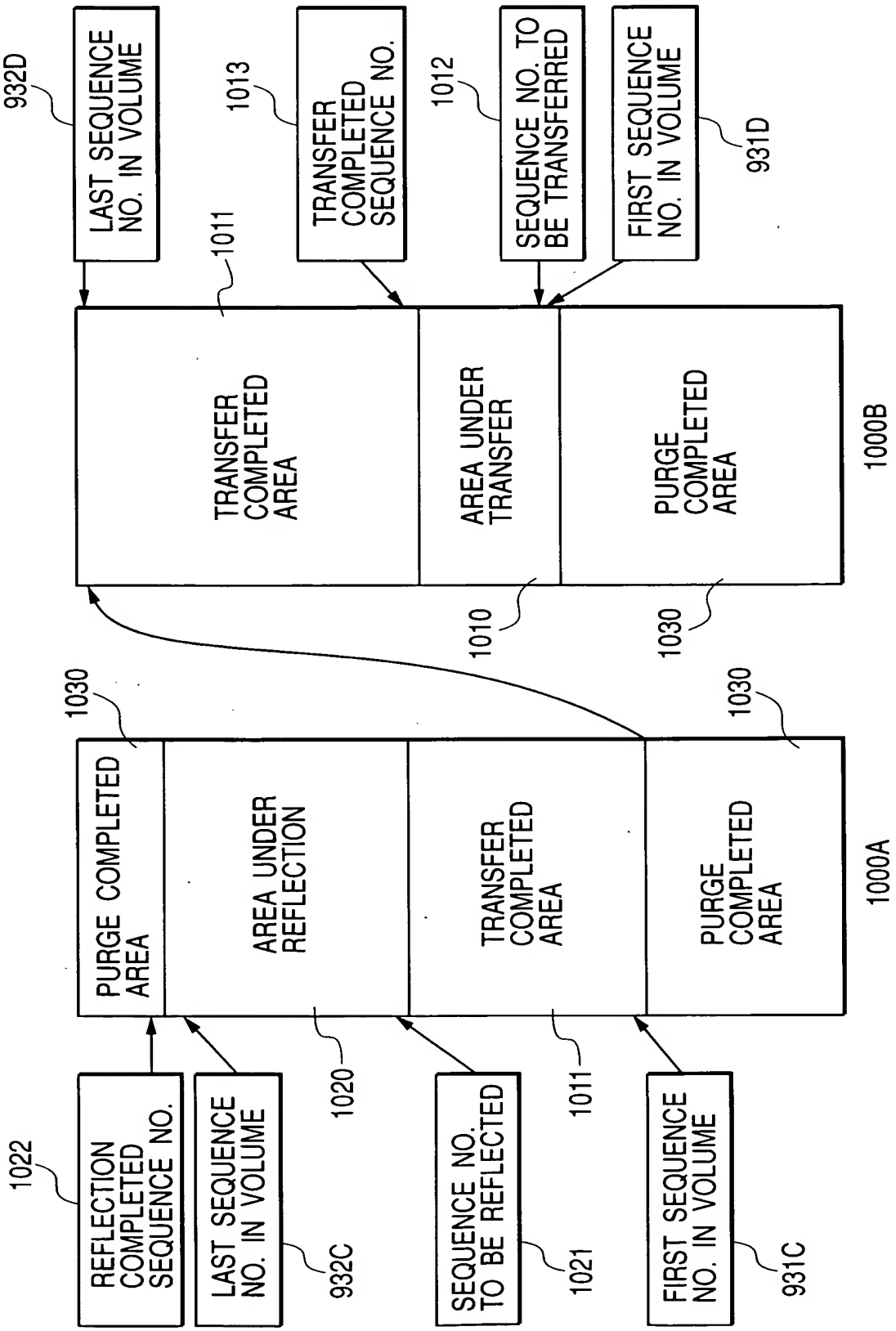

LAST SEQUENCE NO. IN VOLUME
932D
TRANSFER COMPLETED SEQUENCE NO.
1013
SEQUENCE NO. TO BE TRANSFERRED
1012
FIRST SEQUENCE NO. IN VOLUME
931D
1011
TRANSFER COMPLETED AREA
AREA UNDER TRANSFER
PURGE COMPLETED AREA
1000B
1010
1030
1030
1030
PURGE COMPLETED AREA
AREA UNDER REFLECTION
TRANSFER COMPLETED AREA
PURGE COMPLETED AREA
1000A
REFLECTION COMPLETED SEQUENCE NO.
1022
LAST SEQUENCE NO. IN VOLUME
932C
1020
SEQUENCE NO. TO BE REFLECTED
1021
1011
FIRST SEQUENCE NO. IN VOLUME
931C

FIG. 9

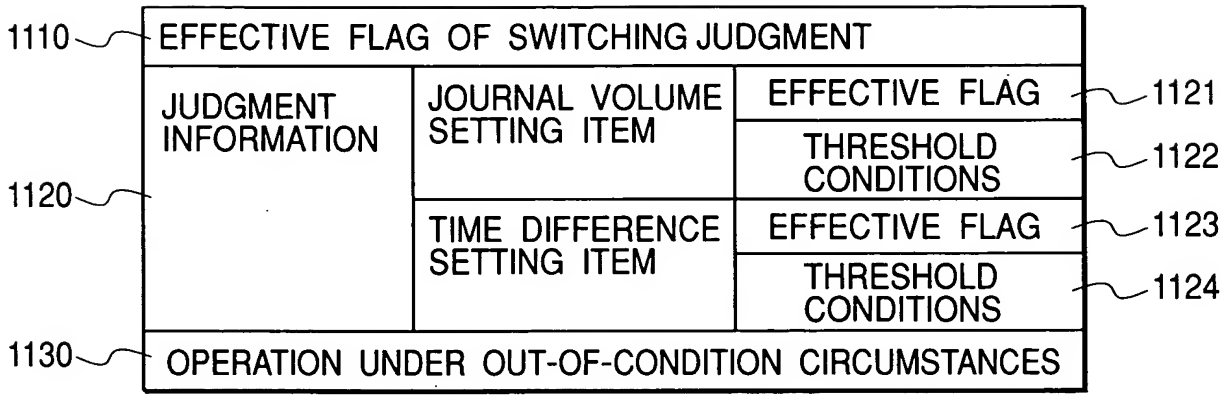

1110
EFFECTIVE FLAG OF SWITCHING JUDGMENT
JUDGMENT INFORMATION
1120
JOURNAL VOLUME SETTING ITEM
EFFECTIVE FLAG
1121
THRESHOLD CONDITIONS
1122
TIME DIFFERENCE SETTING ITEM
EFFECTIVE FLAG
1123
THRESHOLD CONDITIONS
1124
1130
OPERATION UNDER OUT-OF-CONDITION CIRCUMSTANCES

FIG. 10

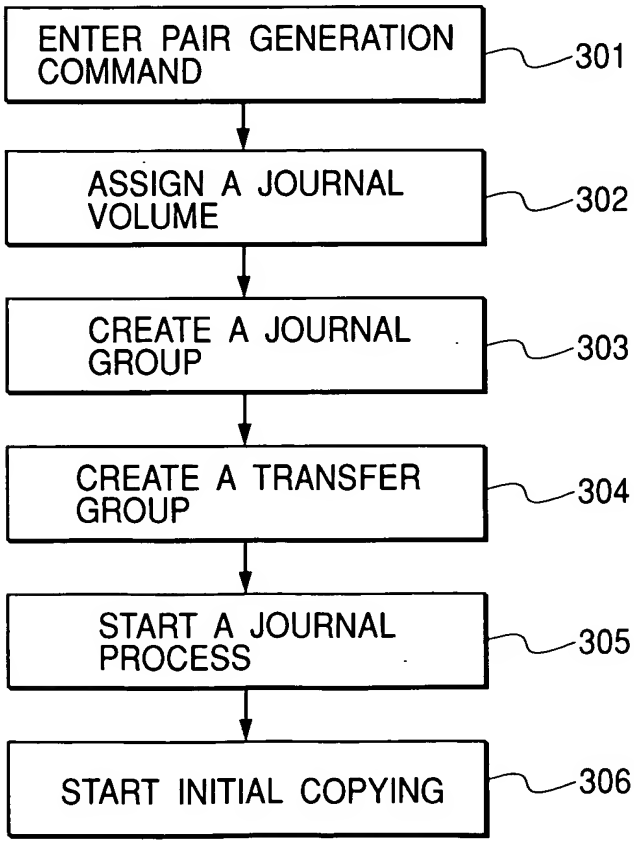

ENTER PAIR GENERATION COMMAND
301
ASSIGN A JOURNAL VOLUME
302
CREATE A JOURNAL GROUP
303
CREATE A TRANSFER GROUP
304
START A JOURNAL PROCESS
305
START INITIAL COPYING
306

FIG. 11

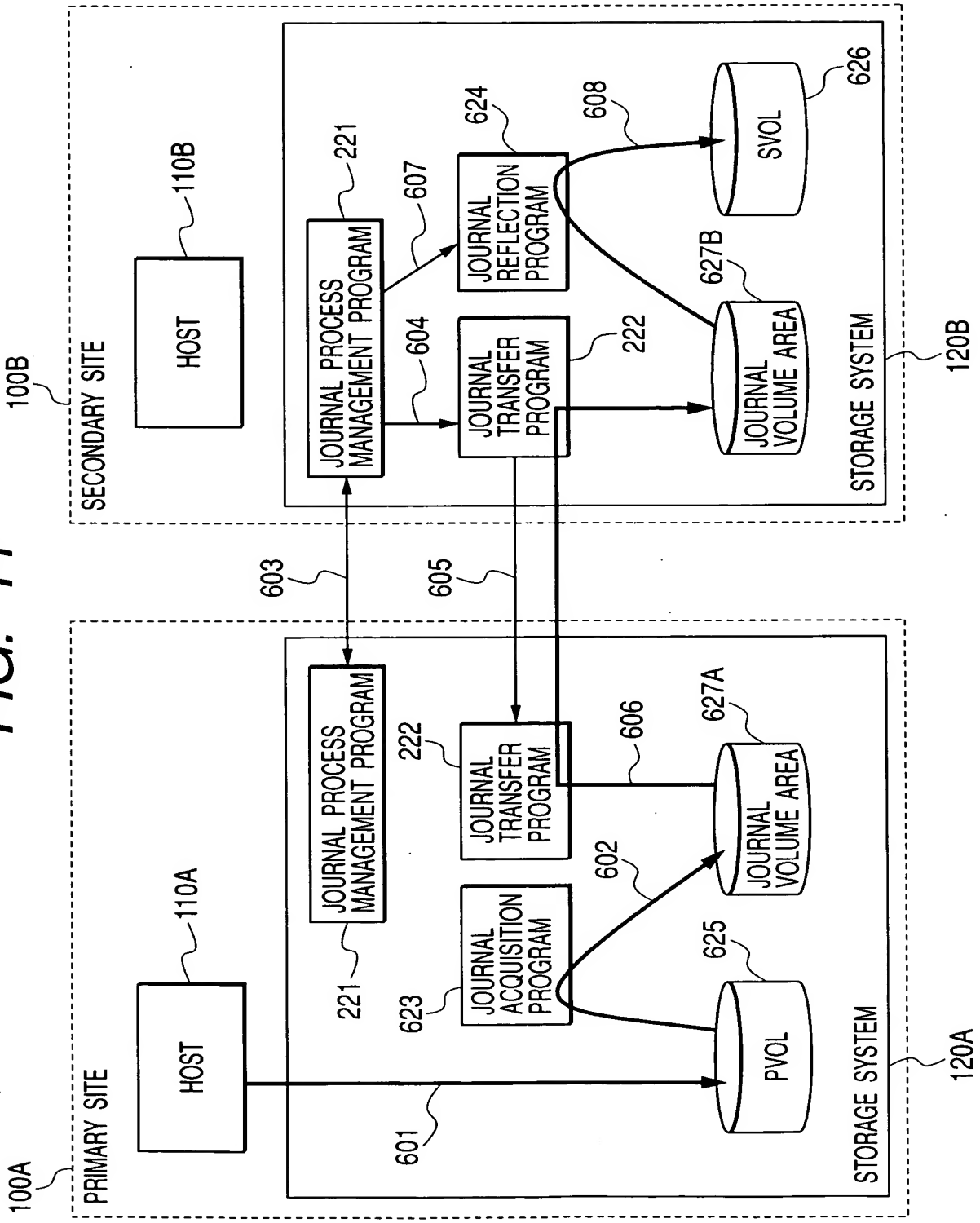

100B
SECONDARY SITE
HOST
110B
221
JOURNAL PROCESS MANAGEMENT PROGRAM
607
JOURNAL REFLECTION PROGRAM
624
608
SVOL
626
604
JOURNAL TRANSFER PROGRAM
222
627B
JOURNAL VOLUME AREA
STORAGE SYSTEM
120B
603
605
100A
PRIMARY SITE
HOST
110A
JOURNAL PROCESS MANAGEMENT PROGRAM
221
222
JOURNAL TRANSFER PROGRAM
606
627A
JOURNAL VOLUME AREA
602
623
JOURNAL ACQUISITION PROGRAM
625
PVOL
601
STORAGE SYSTEM
120A

FIG. 12

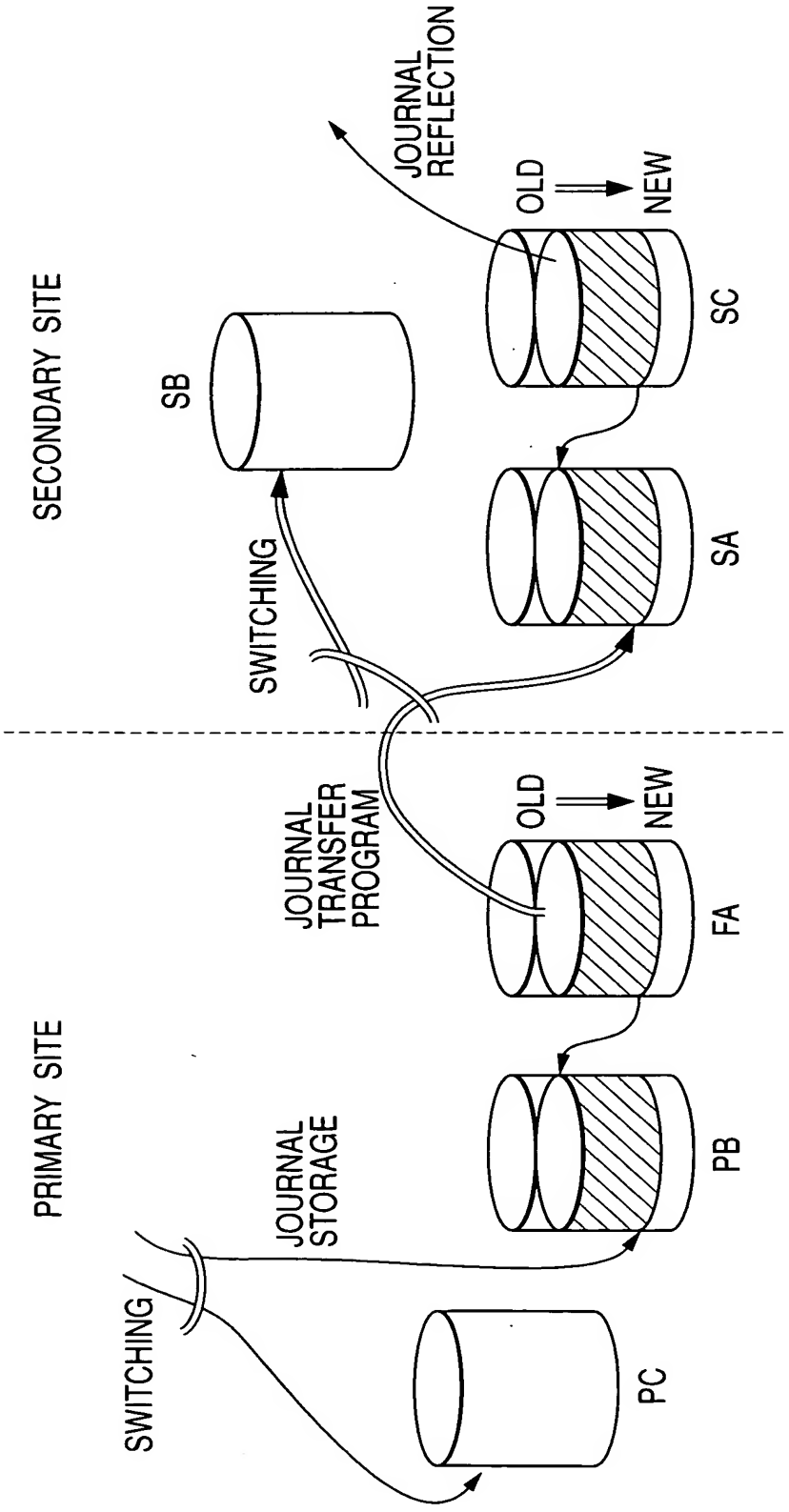

SECONDARY SITE
PRIMARY SITE
JOURNAL REFLECTION
OLD
NEW
SC
SB
SA
SWITCHING
JOURNAL TRANSFER PROGRAM
FA
JOURNAL STORAGE
PB
PC
SWITCHING

FIG. 13

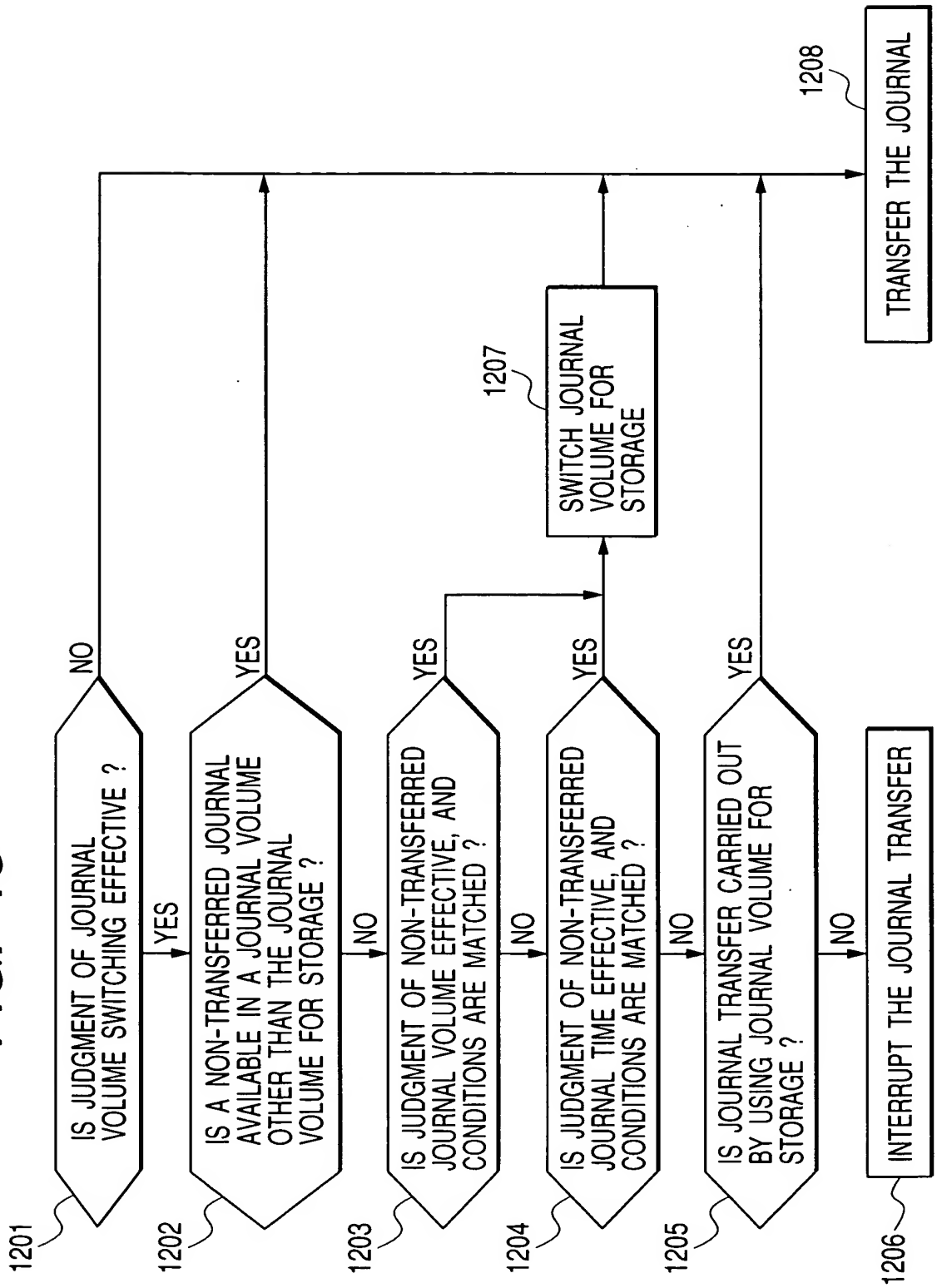

IS JUDGMENT OF JOURNAL VOLUME SWITCHING EFFECTIVE ?
IS A NON-TRANSFERRED JOURNAL AVAILABLE IN A JOURNAL VOLUME OTHER THAN THE JOURNAL VOLUME FOR STORAGE ?
IS JUDGMENT OF NON-TRANSFERRED JOURNAL VOLUME EFFECTIVE, AND CONDITIONS ARE MATCHED ?
IS JUDGMENT OF NON-TRANSFERRED JOURNAL TIME EFFECTIVE, AND CONDITIONS ARE MATCHED ?
IS JOURNAL TRANSFER CARRIED OUT BY USING JOURNAL VOLUME FOR STORAGE ?
INTERRUPT THE JOURNAL TRANSFER
SWITCH JOURNAL VOLUME FOR STORAGE
TRANSFER THE JOURNAL
NO
YES
1201
1202
1203
1204
1205
1206
1207
1208

FIG. 14

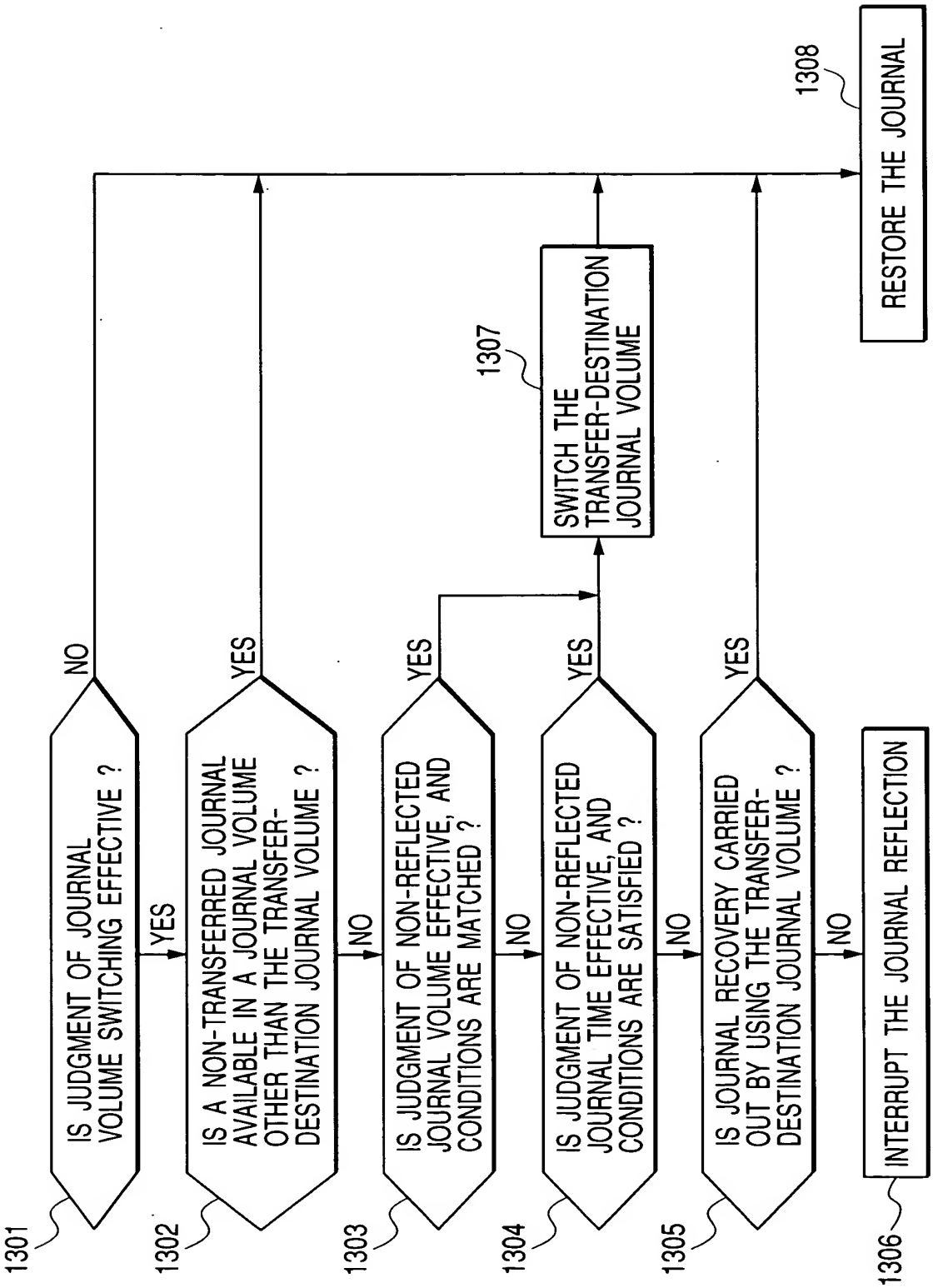

IS JUDGMENT OF JOURNAL VOLUME SWITCHING EFFECTIVE ?
IS A NON-TRANSFERRED JOURNAL AVAILABLE IN A JOURNAL VOLUME OTHER THAN THE TRANSFER-DESTINATION JOURNAL VOLUME ?
IS JUDGMENT OF NON-REFLECTED JOURNAL VOLUME EFFECTIVE, AND CONDITIONS ARE MATCHED ?
IS JUDGMENT OF NON-REFLECTED JOURNAL TIME EFFECTIVE, AND CONDITIONS ARE SATISFIED ?
IS JOURNAL RECOVERY CARRIED OUT BY USING THE TRANSFER-DESTINATION JOURNAL VOLUME ?
INTERRUPT THE JOURNAL REFLECTION
SWITCH THE TRANSFER-DESTINATION JOURNAL VOLUME
RESTORE THE JOURNAL
NO
YES
NO
YES
NO
YES
NO
YES
NO
1301
1302
1303
1304
1305
1306
1307
1308

FIG. 15

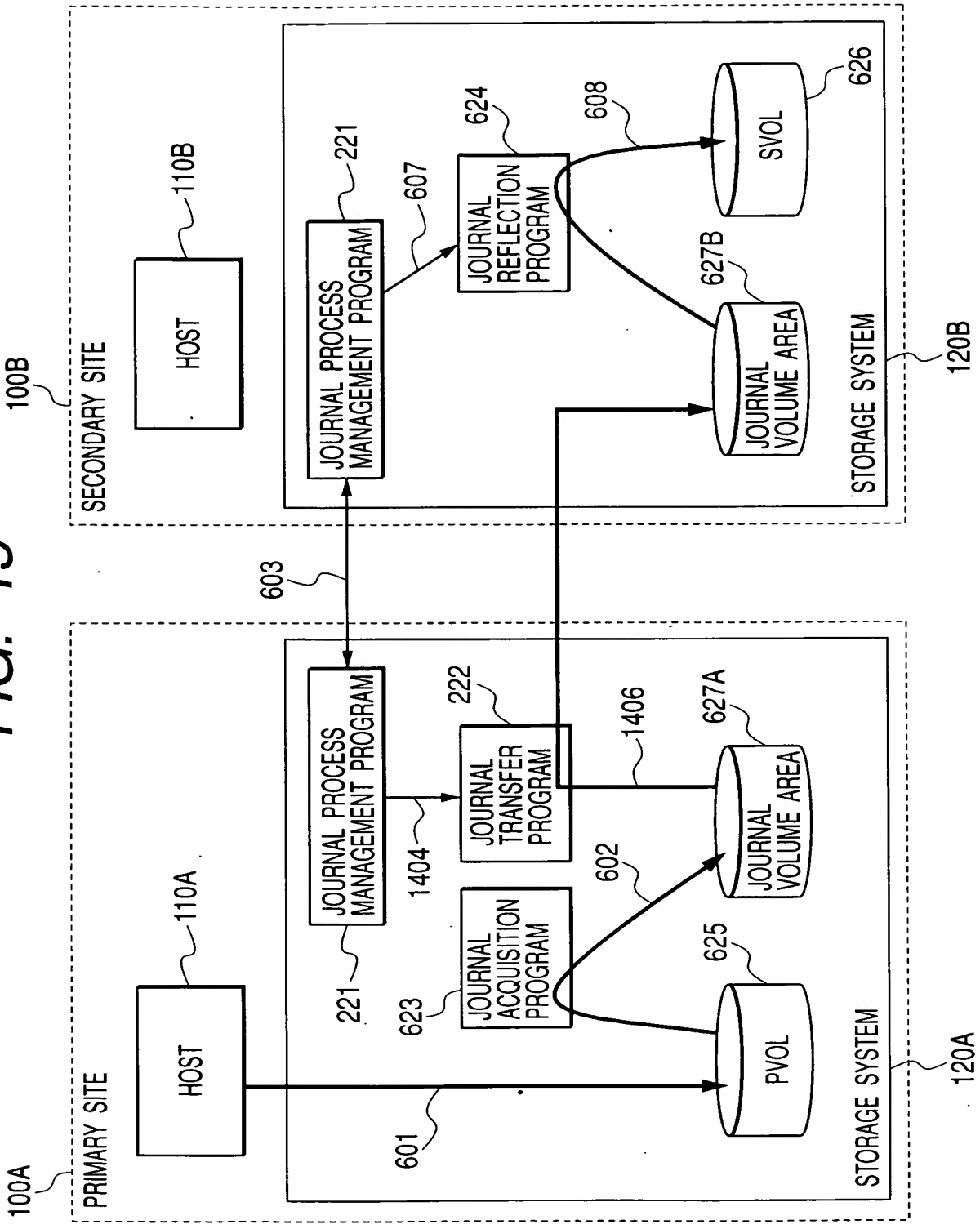

100B
SECONDARY SITE
HOST
110B
JOURNAL PROCESS MANAGEMENT PROGRAM
221
607
JOURNAL REFLECTION PROGRAM
624
608
SVOL
626
627B
JOURNAL VOLUME AREA
STORAGE SYSTEM
120B
603
100A
PRIMARY SITE
HOST
110A
JOURNAL PROCESS MANAGEMENT PROGRAM
221
1404
JOURNAL TRANSFER PROGRAM
222
1406
627A
JOURNAL VOLUME AREA
623
JOURNAL ACQUISITION PROGRAM
602
625
PVOL
601
STORAGE SYSTEM
120A

FIG. 16

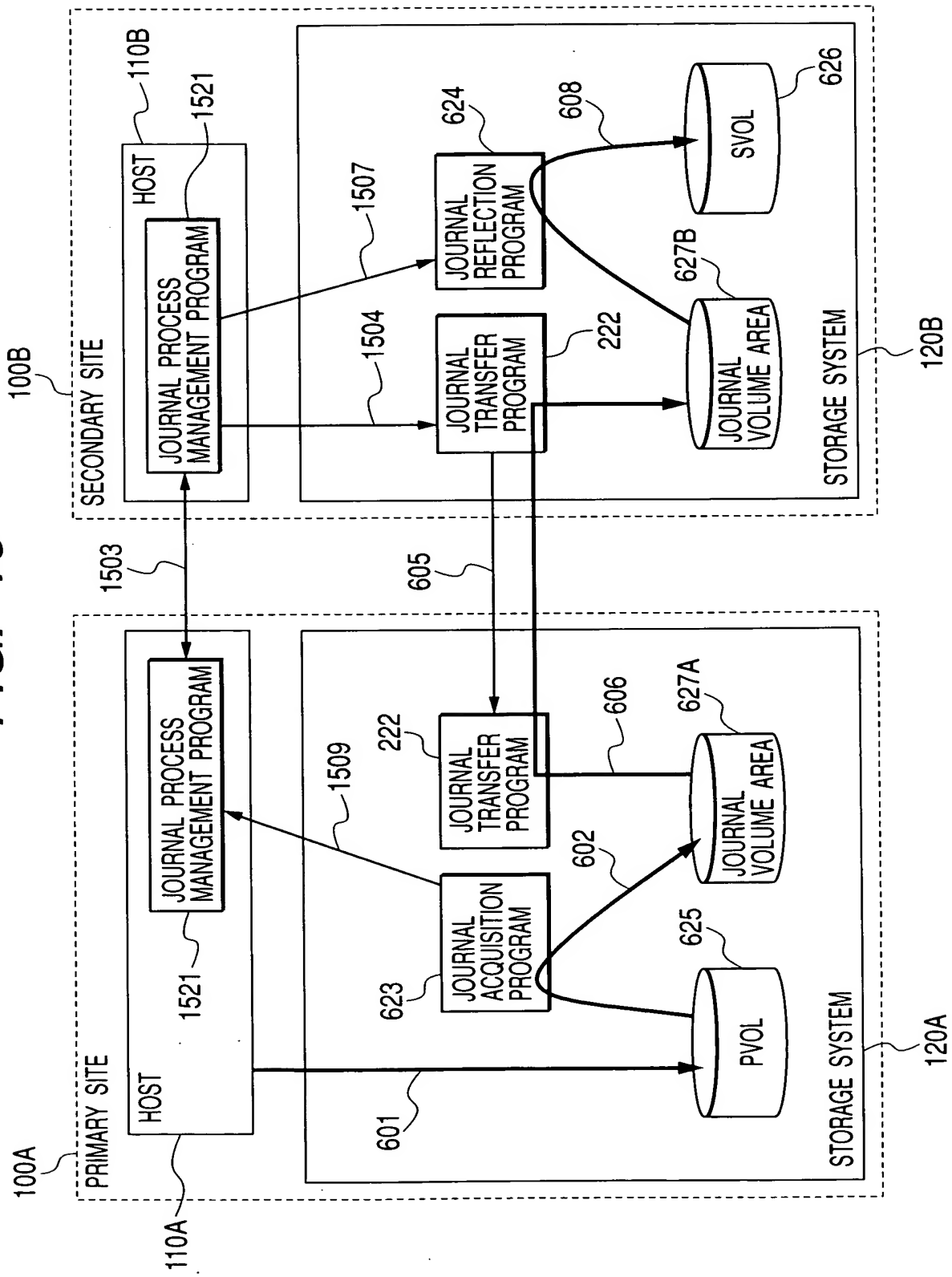
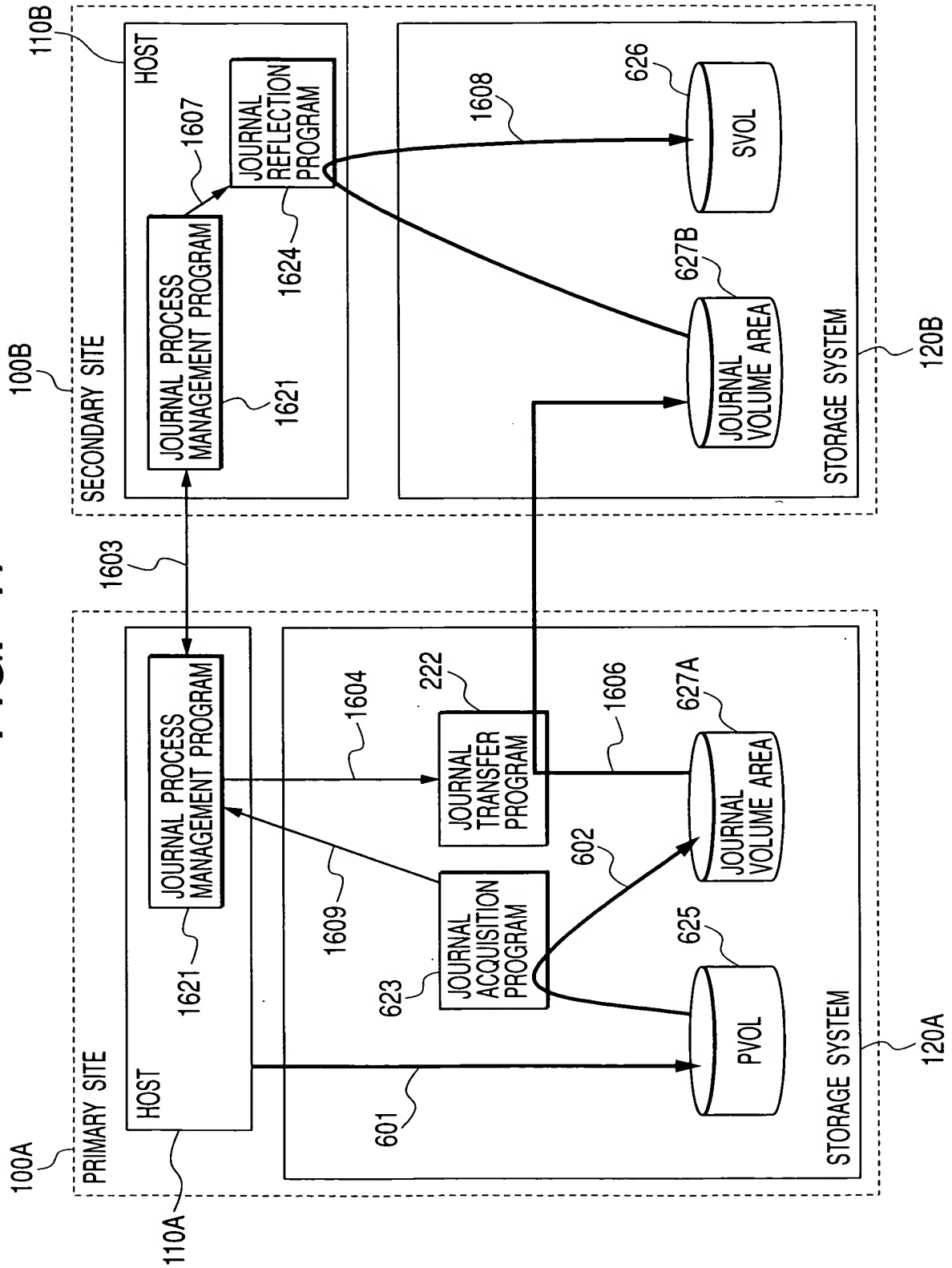

100B
SECONDARY SITE
110B
HOST
1521
JOURNAL PROCESS MANAGEMENT PROGRAM
1507
1504
624
JOURNAL REFLECTION PROGRAM
222
JOURNAL TRANSFER PROGRAM
608
SVOL
626
627B
JOURNAL VOLUME AREA
STORAGE SYSTEM
120B
1503
605
100A
PRIMARY SITE
HOST
1521
JOURNAL PROCESS MANAGEMENT PROGRAM
1509
222
JOURNAL TRANSFER PROGRAM
606
627A
JOURNAL VOLUME AREA
602
623
JOURNAL ACQUISITION PROGRAM
625
PVOL
601
STORAGE SYSTEM
120A
110A

FIG. 17


110B
HOST
JOURNAL REFLECTION PROGRAM
1607
1608
626
SVOL
JOURNAL PROCESS MANAGEMENT PROGRAM
1624
1621
627B
JOURNAL VOLUME AREA
100B
SECONDARY SITE
STORAGE SYSTEM
120B
1603
JOURNAL PROCESS MANAGEMENT PROGRAM
1604
222
JOURNAL TRANSFER PROGRAM
1606
627A
JOURNAL VOLUME AREA
602
1609
JOURNAL ACQUISITION PROGRAM
625
623
PVOL
601
HOST
1621
100A
PRIMARY SITE
STORAGE SYSTEM
120A
110A